

CLAIMS

What is claimed is:

1. A method for increasing the manufacturing yield for a predetermined device, said device composed of one or more multiple layer die, said method comprising the steps of:
determining diagnostically the number of functioning layers of each of said multiple layer die; and
sorting each of said multiple layer die based on said number of functioning layers.
2. The method of claim 1, further comprising combining two or more of said multiple layer die so that functioning layers of each of said multiple layer die are interconnected with each other.
3. The method of claim 1, wherein said determining step is performed through testing of one or more edge interconnects of said multiple layer die.
4. The method of claim 2, wherein said combining step comprises vertical stacking of two or more die.
5. The method of claim 2 wherein said combining step comprises edge stacking of two or more die.

6. The method of claim 1, further comprising storing health data associated with each said multiple layer die on one or more layers or a portion of one or more layers .
7. The method of claim 6, wherein said health data comprises indication of known good layers or known bad layers on each said multiple layer die.
8. The method of claim 1, wherein said at least one of said multiple layer die comprises
a first selectively bonded semiconductor layer vertically supported on a substrate, said bonded semiconductor layer containing weak bond regions and strong bond regions;
a second selectively bonded semiconductor layer vertically supported on said first selectively bonded semiconductor layer;
wherein a semiconductor device portion is created at or on said weak bond regions,
wherein said semiconductor device portion vertically spans said first selectively bonded semiconductor layer and said second selectively bonded semiconductor layer; and
wherein said die is formed by dicing said bonded semiconductor layers.

9. A method for providing a device having at least a predetermined number of known good layers, said device composed of one or more multiple layer die, said method comprising the steps of:

determining diagnostically the number of functioning layers of each of said multiple layer die;

sorting each of said multiple layer die based on said number of functioning layers into a plurality of bins, each bin having an associated minimum number of known good layers; and

selecting one of said multiple layer die having said predetermined number of known good layers from one of said bins having an associated minimum number of known good layers at least equal to said predetermined number of known good layers.

10. The method of claim 9, wherein said at least one of said multiple layer die comprises a first selectively bonded semiconductor layer vertically supported on a substrate, said bonded semiconductor layer containing weak bond regions and strong bond regions;

a second selectively bonded semiconductor layer vertically supported on said first selectively bonded semiconductor layer;

wherein a semiconductor device portion is created at or on said weak bond regions,

wherein said semiconductor device portion vertically spans said first selectively bonded semiconductor layer and said second selectively bonded semiconductor layer; and

wherein said die is formed by dicing said bonded semiconductor layers.

11. A method for providing a device having at least a predetermined number of known good layers, said device composed of one or more multiple layer die, said method comprising the steps of:

determining diagnostically the number of functioning layers of each of said multiple layer die;

sorting each of said multiple layer die based on said number of functioning layers into a plurality of bins, each bin having an associated minimum number of known good layers;

selecting a plurality of said multiple layer die having a sum of known good layers at least equal to said predetermined number of known good layers; and

combining said selected plurality of multiple layer die to form a combined die having a number of known good layers at least equal to said predetermined number of known good layers.

12. The method as in claim 11, wherein said selected plurality of multiple layer die are combined horizontally and interconnected through one or more edge interconnects on each of said selected plurality of multiple layer die.

13. The method as in claim 11, wherein said selected plurality of multiple layer die are combined vertically.

14. The method of claim 11, wherein said at least one of said multiple layer die comprises
a first selectively bonded semiconductor layer vertically supported on a substrate, said
bonded semiconductor layer containing weak bond regions and strong bond regions;
a second selectively bonded semiconductor layer vertically supported on said first
selectively bonded semiconductor layer;
wherein a semiconductor device portion is created at or on said weak bond regions,
wherein said semiconductor device portion vertically spans said first selectively
bonded semiconductor layer and said second selectively bonded semiconductor layer; and
wherein said die is formed by dicing said bonded semiconductor layers.

15. A method for providing a device having at least a predetermined number of known
good layers, said device composed of one or more multiple layer die, said method comprising
the steps of:

determining diagnostically the number of functioning layers of each of said multiple
layer die;

sorting each of said multiple layer die based on said number of functioning layers into
a plurality of bins, each bin having an associated minimum number of known good layers;

selecting one of said a multiple layer die a number of known good layers greater than
said predetermined number of known good layers;

slicing said selected multiple layer die to form a first multiple layer die portion having
a number of known good layers at least equal to said predetermined number of known good
layers and a second multiple layer die portion; and

sorting said second multiple layer die portion into one of said bins having a minimum number of known good layers corresponding to the number of known good layers of said second multiple layer die portion.

16. The method of claim 15, wherein said slicing occurs at a known bad layer of said selected multiple layer die.

17. The method of claim 15, wherein said at least one of said multiple layer die comprises a first selectively bonded semiconductor layer vertically supported on a substrate, said bonded semiconductor layer containing weak bond regions and strong bond regions;

a second selectively bonded semiconductor layer vertically supported on said first selectively bonded semiconductor layer;

wherein a semiconductor device portion is created at or on said weak bond regions,

wherein said semiconductor device portion vertically spans said first selectively bonded semiconductor layer and said second selectively bonded semiconductor layer; and

wherein said die is formed by dicing said bonded semiconductor layers.

18. A method for sorting a plurality of wafer stacks comprising, each said wafer stack comprising a plurality of vertically integrated devices, comprising:

performing diagnostics on one or all devices on the wafer; and

sorting the wafer stacks based on how many vertically integrated devices (to be subsequently diced) of the wafer stack have a predetermined number of known good layers.

19. A method for sorting a plurality of wafer stacks comprising, each said wafer stack comprising a plurality of vertically integrated devices, comprising:
performing diagnostics on one or all devices on the wafer; and
sorting the wafer stacks based on the minimum number of known good layers of all of the devices populated on the wafer stack.